

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
12 September 2003 (12.09.2003)

PCT

(10) International Publication Number
WO 03/075227 A1

(51) International Patent Classification⁷: G07C 9/00

(21) International Application Number: PCT/IB03/00811

(22) International Filing Date: 5 March 2003 (05.03.2003)

(25) Filing Language: Italian

(26) Publication Language: English

(30) Priority Data:
PI2002A000012 5 March 2002 (05.03.2002) IT

(71) Applicants and

(72) Inventors: MASI, Eros [IT/IT]; Via degli Olmi, 46, I-57012 Castiglioncello LI (IT). PAGLIALUNGA, Vincenzo [IT/IT]; Corso Re D'Italia, 11, I-73013 Galatina LE (IT).

(74) Agent: CELESTINO, Marco; Viale Giovanni Pisano, 31, I-56123 PISA (IT).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,

CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

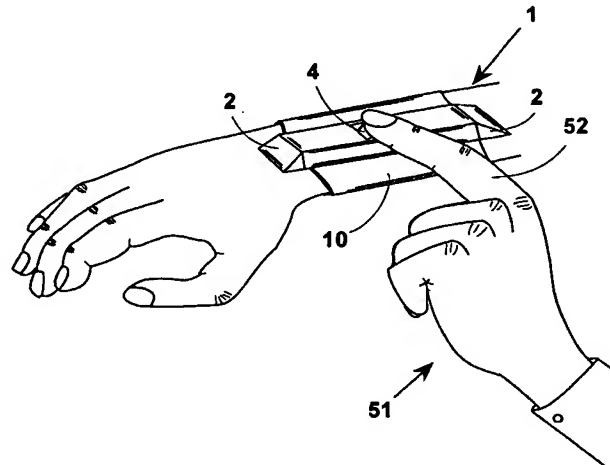
(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD FOR DETECTING THE POSITION AND FOR CONFIRMING THE IDENTITY OF AN INDIVIDUAL



(57) Abstract: A method and a device for testing the presence and verifying the identity of an individual at the receipt, by a bracelet (1) that the individual wears, of a verification signal sent by a central computer unit. The device has a central portion (3) comprising means for receiving the verification signal, means for controlling biometric data and for transmitting data of presence. The bracelet (1) is secured to the wrist or to the ankle of the individual by means of a belt, or wristlet (10), equipped with a closure (11) that can be locked or freely releasable, depending on the individual to be guarded. When requested, the individual that wears the bracelet (1) on a first arm (50), receives a verification signal sent by the central unit, puts a predetermined finger (52) of the second hand (51) on the means of detecting a fingerprint (4) located on the bracelet (1). Then the central unit (40) verifies the identity and the position of the individual (35).

WO 03/075227 A1

BEST AVAILABLE COPY

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G07C9/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 889 474 A (LADUE CHRISTOPH K) 30 March 1999 (1999-03-30) abstract; figures 8,9 column 16, line 15 -column 17, line 15	1-9
Y	WO 01 44836 A (ITALDATA INGEGNERIA DELL IDEA ;BOCCACCI ROBERTO (IT)) 21 June 2001 (2001-06-21) cited in the application abstract; claim 1; figure 2	1-9
Y	EP 0 357 309 A (BI INC) 7 March 1990 (1990-03-07) abstract; figures 1,10 column 19, line 47-54	1-9

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

18 July 2003

Date of mailing of the international search report

01/08/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Höhn, M

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5889474	A	30-03-1999	US 5525969 A	11-06-1996
			US 6144859 A	07-11-2000
			US 5594740 A	14-01-1997
			US 6285868 B1	04-09-2001
WO 0144836	A	21-06-2001	IT RM990761 A1	18-06-2001
			AU 2220501 A	25-06-2001
			BG 106797 A	30-05-2003
			BR 0016436 A	01-10-2002
			CA 2397667 A1	21-06-2001
			CN 1411559 T	16-04-2003
			CZ 20021988 A3	13-11-2002
			EE 200200313 A	16-06-2003
			EP 1242835 A1	25-09-2002
			HU 0203788 A2	28-03-2003
			WO 0144836 A1	21-06-2001
			SK 8742002 A3	06-11-2002
			US 2002190864 A1	19-12-2002
EP 0357309	A	07-03-1990	US 4952928 A	28-08-1990
			DE 68924888 D1	04-01-1996
			DE 68924888 T2	13-06-1996
			EP 0357309 A2	07-03-1990
			HK 1006886 A1	19-03-1999
			US 5369699 A	29-11-1994
			US 5204670 A	20-04-1993

5 / PRTS

10/505162

DT15 Rev'd PCT/PTO 130 AUG 2004
PCT/IB03/00811

WO 03/075227

- 1 -

TITLE

METHOD FOR DETECTING THE POSITION AND FOR CONFIRMING THE
IDENTITY OF AN INDIVIDUAL

Field of the invention

The present invention relates to a method for
measuring the presence of an individual in a predetermined
area and for checking at the same time the identity, in
5 particular for individuals with restriction of freedom,
such as individuals confined within a pre-designated
location, individuals under police surveillance, patients
affected by dangerous infective pathologies etc.

The invention relates also to a device that carries
10 out this method.

Description of the prior art

As known, different devices exist to guard an
individual who, for different reasons, is subject to a
restriction of freedom.

15 For example, patients affected by dangerous infective
pathologies have to be guarded so that they do not leave
predetermined areas of an hospital, or individuals under
police surveillance must be confined within a pre-
designated location.

20 In fact, for the increasing overcrowding of jails and
for reducing the high costs of maintenance of houses of
confinement, financed by the government, it is common to
sentence certain types of offenders to confinement within
the offender's place of residence.

25 Therefore, the need is felt to guard individuals
confined within their residence, guaranteeing that they
remain in a predetermined area. To this end, devices exist
for remotely guarding individuals confined within their
residence, for detecting if they escape or tamper the
30 devices, by exchanging information with a central unit.

These devices, comprising a sender that is secured to

WO 03/075227

PCT/IB03/00811

- 2 -

the wrist or to the ankle of the individual with a plastic belt, exchange signals with a computer, in turn connected to a telephonic line. If the individual leaves the confinement area, an alarm signal is generated. The same
5 occurs if the individual tampers the plastic belt or the processor.

Presently, the known devices used for controlling individuals confined within their residence can only warn the central unit of a possible escape from the area of
10 confinement, but are not capable of measuring the exact position of the escaped individual.

In addition, such devices cannot check whether the individual that should wear the device at the wrist or ankle, is really the individual under surveillance or
15 another person helping him to escape.

Bracelet devices exist for controlling individuals that are associated to identity check systems, for example of biometric type. In WO0144836 a device is described where the individuals confined within their residence, in
20 addition to wear a bracelet, must move periodically to a fixed computerized position and have their fingerprints scanned by a reader. However, this causes a fixed apparatus to be moved all the times the individual is moved, as well as it involves high apparatus costs. This solution, then,
25 is suitable for being used within jails, for guarding individuals in particular areas, but not for those individuals confined within their residence.

Summary of the invention

It is an object of the present invention to provide a
30 method for detecting the position and the presence of an individual in a predetermined place for verifying immediately the identity thereof without the need of fixed local units.

These and other objects are achieved by the method for

WO 03/075227

PCT/IB03/00811

- 3 -

testing the presence and verifying the identity of an individual, according to the present invention, characterised in that it comprises:

- receiving, by a bracelet unit that the individual wears, a verification signal sent by a central unit;
- measuring within a predetermined time at least one biometric record of the individual directly by said bracelet;
- detecting position data of the bracelet;
- 10 - transmitting by the bracelet a set of signals of response comprising said biometric record, and said position data;
- receiving by the central unit said set of signals and comparing with data previously stored.

15 The detection can be also provided of data of presence of the bracelet unit on the individual and/or data of tampering the bracelet.

According to the invention the biometric record can be a fingerprint, or an image of the retina, or a vocal wave
20 file of the individual under surveillance.

In particular, the central unit delivers periodically to the bracelet unit a signal, at a predetermined frequency. Therefore, who wears the device, as instructed at the beginning, should have the fingerprints and/or the retina
25 and/or the voice examined. The biometric record received is then compared with that stored in the database and corresponding to the same individual under surveillance.

The device that carries out the method according to the present invention provides a bracelet unit comprising:

- 30 - means for receiving a verification signal sent by a central unit;
- means for detecting at least one biometric record of the individual;
- means for detecting position data of the bracelet;

WO 03/075227

PCT/IB03/00811

- 4 -

- means for transmitting the detected information to said central unit.

Means can be provided for detecting data of presence of the bracelet unit on the individual, and/or for
5 detecting tamper of the bracelet.

The above described means are integrated in a module comprising a processor and a programmed EEPROM where the application and the main firmware are resident.

Advantageously, the means for detecting position data
10 comprise a GPS device that processes satellite signals.

The means for detecting data of presence of the bracelet unit on the individual can comprise in combination or alternatively:

- a sensor of heart beat,
- 15 - a sensor of body temperature,
- an underskin chip implanted in the individual under surveillance, associated to a system integrated in the bracelet that recognizes an identification code emitted by the underskin chip.

20 In a preferred embodiment, the device is elongated, parallelepiped shaped, with a central portion that comprises the means for receiving, detecting and transmitting and two side ends made of flexible material, preferably rubber-like, which can deform elastically for
25 not impeding movement when wearing the device.

In particular, the central part of the device comprises at least a first sensor for detecting the fingerprints, a second sensor for controlling the heart beat and the temperature, a chip and a battery.

30 Alternatively, or in addition to the sensor for detecting the fingerprints, another device is provided of biometric detection.

In a first embodiment, the device of biometric detection is a scanner of the retina, which is available

WO 03/075227

PCT/IB03/00811

- 5 -

on the market. In this case, means can be provided for allowing the alignment of the eye, not described in detail.

In a second embodiment, the device of biometric
5 detection is a microphone associated to a chip of voice recognition.

Preferably, the device, made of low allergenic material, is secured to the wrist or to the ankle or other part of the body of the individual, by means of a tamper
10 resistant belt, in case the device is used, for example, for surveillance of individuals confined within their residence. Alternatively, this belt is provided with a normal closure mechanism, that can be easily opened.

A preferred embodiment of the device, according to the
15 present invention, provides the following dimensions:

- length set between 8 and 16 cm;
- width set between 2 and 6 cm;
- height set between 1 and 4 cm.

Brief description of the drawings

20 Further characteristics and the advantages of the method and of the unit according to the invention will be made clearer with the following description of an embodiment thereof, exemplifying but not limitative, with reference to the attached drawings, wherein:

- 25 - figure 1 shows a diagrammatical view of the method for testing the presence and verifying the identity of an individual, according to the present invention;
- figures 2 and 3 show respectively a perspective view and a top plan view of a bracelet for testing the presence
30 and verifying the identity of an individual, according to the present invention;
- figure 4 shows an elevational side view of the apparatus diagrammatically cross sectioned for showing the apparatus inside;

WO 03/075227

PCT/IB03/00811

- 6 -

- figures 5 and 6 show an exemplifying perspective view of the bracelet, according to the invention, secured to the wrist of an individual whose freedom is restricted;
- figures 7 and 8 show two flowsheets, for the detecting
5 procedure respectively on board of the bracelet and in the central unit.

Description of a preferred embodiment

According to the invention, with reference to figure 1, a bracelet unit 1 for detecting the position and for
10 confirming the identity of an individual 35 who wears it is equipped with a device for detecting a biometric record, in particular a fingerprint.

By using bracelet 1, for testing the presence and verifying the identity of individual 35, a step is
15 provided of receiving, by bracelet 1, a verification signal 42 by a central unit 40, arranged with a computer 41. From that moment, individual 35 that wears bracelet 1 must put within a certain time a predetermined finger on the detection device, integrated to bracelet 1, which
20 scans the fingerprint.

Before or after measuring the biometric record of individual 35 the position is detected of bracelet 1 and then of individual 35 by the GPS network, consisting of, as known, a plurality of satellites 20, which send position
25 signals 22. Bracelet 1, in fact, analyses the satellite signals and produces a corresponding position signal. Furthermore, bracelet 1 produces a signal of presence, of known type, confirming that individual 35 is wearing it and has not tampered it.

30 Central unit 40 can be assisted by a guard 45 who, in addition to check that bracelet 1 is in the desired area, for example a house 30, verifies that bracelet 1 has not emitted signals of tamper. Furthermore, guard 45 checks the signal of presence of bracelet 1, proving that the

WO 03/075227

PCT/IB03/00811

- 7 -

individual is wearing it.

The latter signal can be obtained by a sensor of heart beat, or a sensor of body temperature, or it can be associated to an underskin chip implanted in the individual under surveillance. In this case, the bracelet recognizes an identification code emitted by the underskin chip.

The detection device on bracelet 1 can either directly analyse the biometric data or scan the biometric data that are transmitted as files to central unit 40 which computes them.

Figures from 2 to 4 show a possible embodiment of bracelet 1, according to the invention, having parallelepiped elongated shape, with two ends 2 of resilient material and a central portion 3 comprising the means for receiving the verification signal, for detecting the biometric record and for transmitting the data of presence.

Bracelet 1 is secured to the wrist or to the ankle of individual 35 (figure 5 and 6) by means of a belt 10, or wristlet, with a closure 11 that can be either with a lock or freely releasable, according to the kind of surveillance strategy.

The bracelet can also be put on the ankle, or can be made as different device for detecting the presence and checking the identity of the individual, i.e. configured for being put on in another way, for example by a belt, strap, or incorporated in a garment.

In particular, in figure 4 the means for receiving, controlling and transmitting the data are diagrammatically shown, comprising a chip 7, a sensor for detecting the biometric record 4, a sensor for analysis of the heart beat 5 and a battery 6.

In figures 5 and 6 the steps are diagrammatically shown

WO 03/075227

PCT/IB03/00811

- 8 -

for scanning a finger 60, for example the index, owing to bracelet 1. Individual 35 wears bracelet 1, according to the invention, on a first arm 50 and, once received the verification signal 42 from central unit 40, puts the index
5 52 of second hand 51 on the means for detecting the biometric record 4 located on bracelet 1. Then, central unit 40 verifies the identity of individual 35 and proceeds as already specified.

The device of biometric detection 4 is a scanner of
10 fingerprints available on the market, with miniaturized integrated circuit.

Alternatively, the device of biometric detection 4 is a scanner of the retina, which is also available on the market. In this case, means can be provided for allowing
15 the alignment of the eye, not described in detail.

As further alternative the device of biometric detection 4 is a microphone associated to a voice recognition chip. In this case, more vocal sequences can be provided for, that are asked to the individual for
20 being pronounced in order to carry out the recognition.

In the device above described hardware and software elements are resident implementable by a skilled person without difficulty. The logic of operation can be of "event-driven" type, i.e. operated as the events occur,
25 for giving an image of the position, identity, etc., of the guarded individual responsive to the data provided by the bracelet and based on a behaviour model predetermined by the central unit. When a bracelet signals that it is not any more in a "normal or foreseeable" situation
30 (mechanical malfunction, shock, etc.) the central unit is immediately informed updating the central monitoring unit.

With reference to figures 7 and 8, the software residing respectively in the bracelet and in the central unit provide a main routine, with continuous or discrete

WO 03/075227

PCT/IB03/00811

- 9 -

verification of the position of the bracelet and of the signal that the individual is wearing it. The verification of the biometric data, instead, is carried out by the central unit either randomly, or under manual demand of an operator at the central unit.

The central unit comprises a standard architecture with local ETHERNET ISO802.3 network. On this LAN the many computers are connected dedicated to particular functions: server of data base, of communication, of maintenance, workstations. The computers used are based on PC PENTIUM technology, with Windows NT operating system and Oracle Data base. The application software is written in proprietary language, and language SQL for access to the Oracle Data base.

The communication network that allows the exchange of data with the many bracelets distributed on the territory is made with intelligent units and communication sub networks: LAN - Local Area Network, at the Central unit; WArN - Wide Area radio Network at the mobile unit; SRRC - Short Range Radio Communication, at the mobile unit.

On this extended network a TCP/IP communication protocol is used, which defines the rules for exchanging messages and specifies the anomalies, all this independently by the network technology used for connecting physically the many computers. The WArN used is the cellular network GSM - SMS. The apparatus installed on the bracelets and the computer installed in the central unit are capable of exchanging data by the telephonic cellular network with SMS and Data Transfer technique.

The control unit monitors the many bracelets spread on the territory by controlling the GPS position data sent via the communication network (GSM, GPRS) by the hardware contained in the bracelet. The remote identification of the geographical data is immediately displayed by an icon

WO 03/075227

PCT/IB03/00811

- 10 -

on the digital maps of the examined territory and then with the exact position, i.e street and number, and overlapping the image of the examined area (orthophoto and/or satellite photo). Each icon returns the reference
5 relative to the guarded individual, such as name and /or other.

The software of the geographical data can be installed both on Client-Server architecture and on Intranet or Internet network and equipped with various known functions
10 such as: pan, zoom in, zoom out, query, etc.

The remote identification of the geographical data is unique, since each apparatus is characterised singularly by an identification key (Password) and by the system (Login).

15 The foregoing description of a specific embodiment will so fully reveal the invention according to the conceptual point of view, so that others, by applying current knowledge, will be able to modify and/or adapt for various applications such an embodiment without further
20 research and without parting from the invention, and it is therefore to be understood that such adaptations and modifications will have to be considered as equivalent to the specific embodiment. The means and the materials to realise the different functions described herein could
25 have a different nature without, for this reason, departing from the field of the invention. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

WO 03/075227

PCT/IB03/00811

- 11 -

CLAIMS

1. Method for testing the presence and verifying the identity of an individual, characterised in that it comprises the steps of:
 - 5 - receiving, by a bracelet unit that the individual wears, a verification signal sent by a central unit;
 - measuring within a predetermined time at least one biometric record of the individual directly by said bracelet;
 - 10 - detecting position data of the bracelet;
 - transmitting by the bracelet a set of signals of response comprising said biometric record and said position data;
 - receiving by the central unit said set of signals and comparison with data previously stored.
 - 15
2. Method for testing the presence and verifying the identity of an individual, according to claim 1, wherein said biometric record can be chosen among a fingerprint, an image of the retina, a vocal wave file
20 of the individual under surveillance.
3. Method for testing the presence and verifying the identity of an individual, wherein the step is provided also of detecting data of presence of the bracelet unit on the individual and/or data of
25 tampering the bracelet.
4. A bracelet unit for testing the presence and verifying the identity of an individual comprising:
 - means for receiving a verification signal sent by a central unit;
 - 30 - means for detecting at least one biometric record of the individual;
 - means for detecting position data of the bracelet;
 - means for transmitting the detected information to said central unit.

WO 03/075227

PCT/IB03/00811

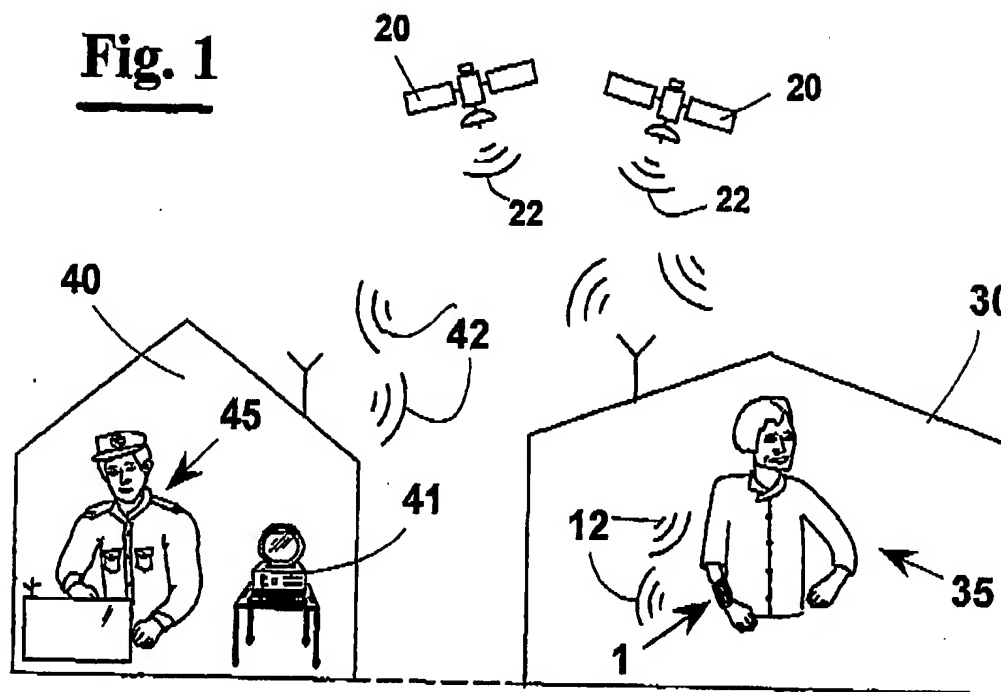
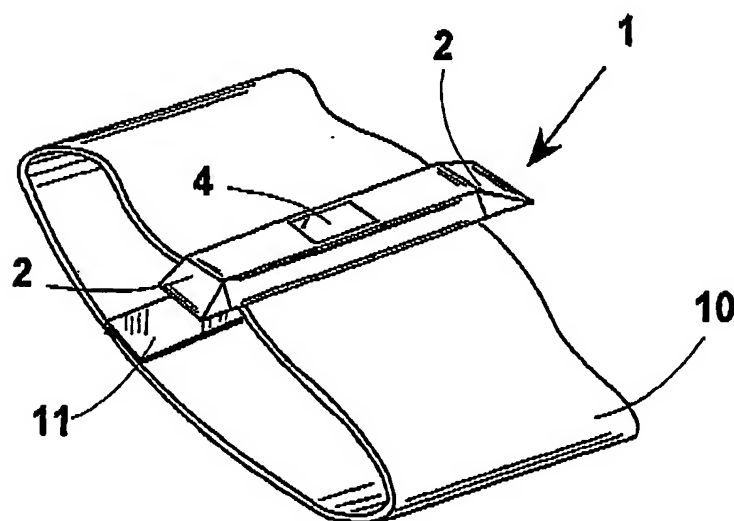
- 12 -

5. Unit according to claim 4, wherein said means for detecting at least one biometric record of the individual are chosen among, in combination or alternatively:
- 5 - a device for detecting fingerprints;
 - a scanner of the retina, associated to means for aligning with the eye of the individual;
 - a microphone associated to a voice recognition chip.
6. Unit according to claim 4, wherein means are provided
10 for detecting data of presence of the bracelet on the individual, and/or means for detecting tamper of the bracelet.
7. Unit according to claim 4, wherein said means for detecting position data comprise a GPS device that
15 processes satellite signals.
8. Unit according to claim 4, wherein said means for detecting data of presence of the bracelet on the individual can comprise in combination or alternatively:
- a sensor of heart beat,
 - 20 - a sensor of body temperature,
 - an underskin chip implanted in the individual under surveillance, associated to a system integrated in the bracelet that recognizes an identification code emitted by the underskin chip.
- 25 9. Unit according to claim 4, characterised by having parallelepiped elongated shape with a central portion that comprises said means for receiving, detecting and transmitting, and two side ends made of flexible material.

WO 03/075227

PCT/IB03/00811

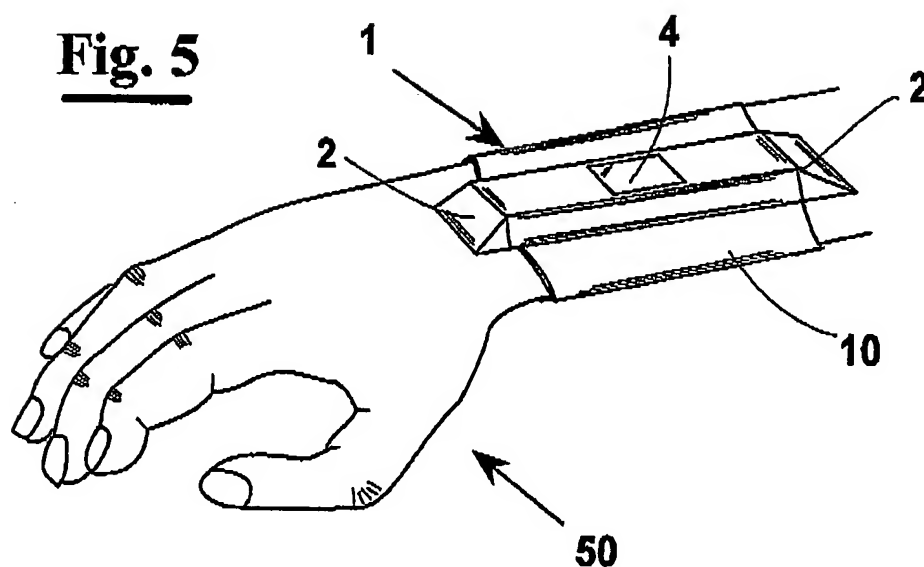
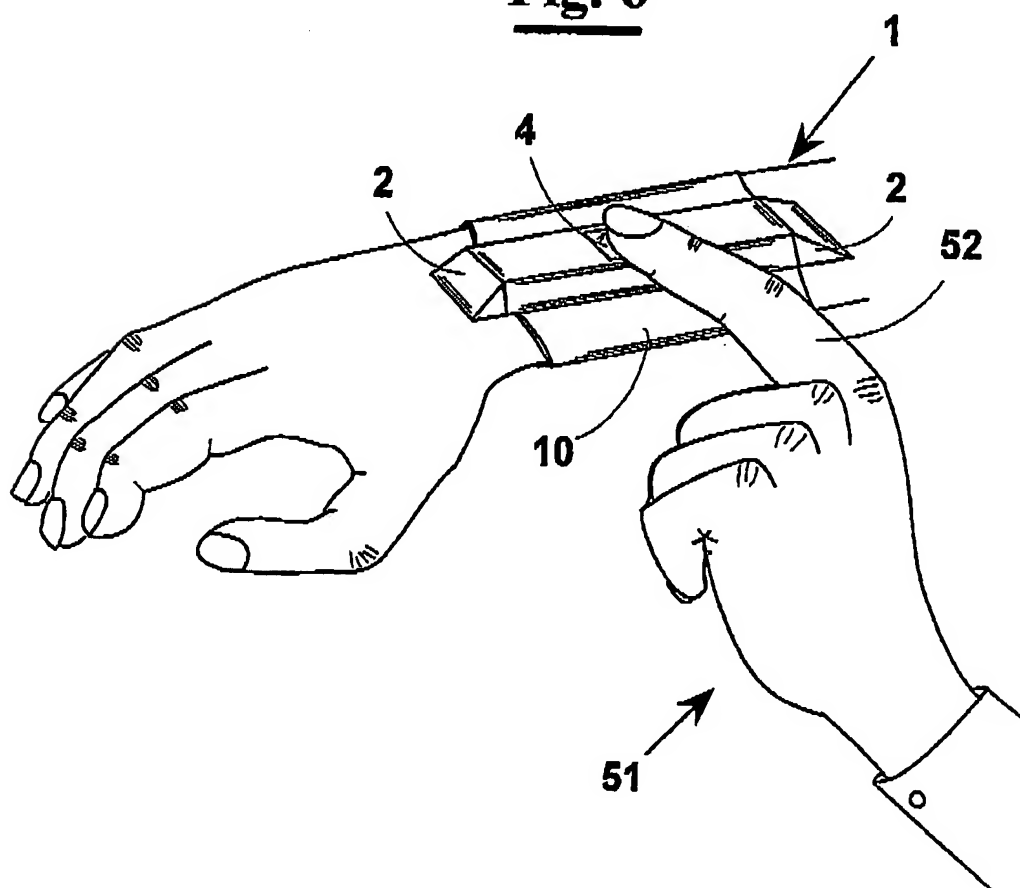
- 1/5 -

Fig. 1**Fig. 2**

WO 03/075227

- 3/5 -

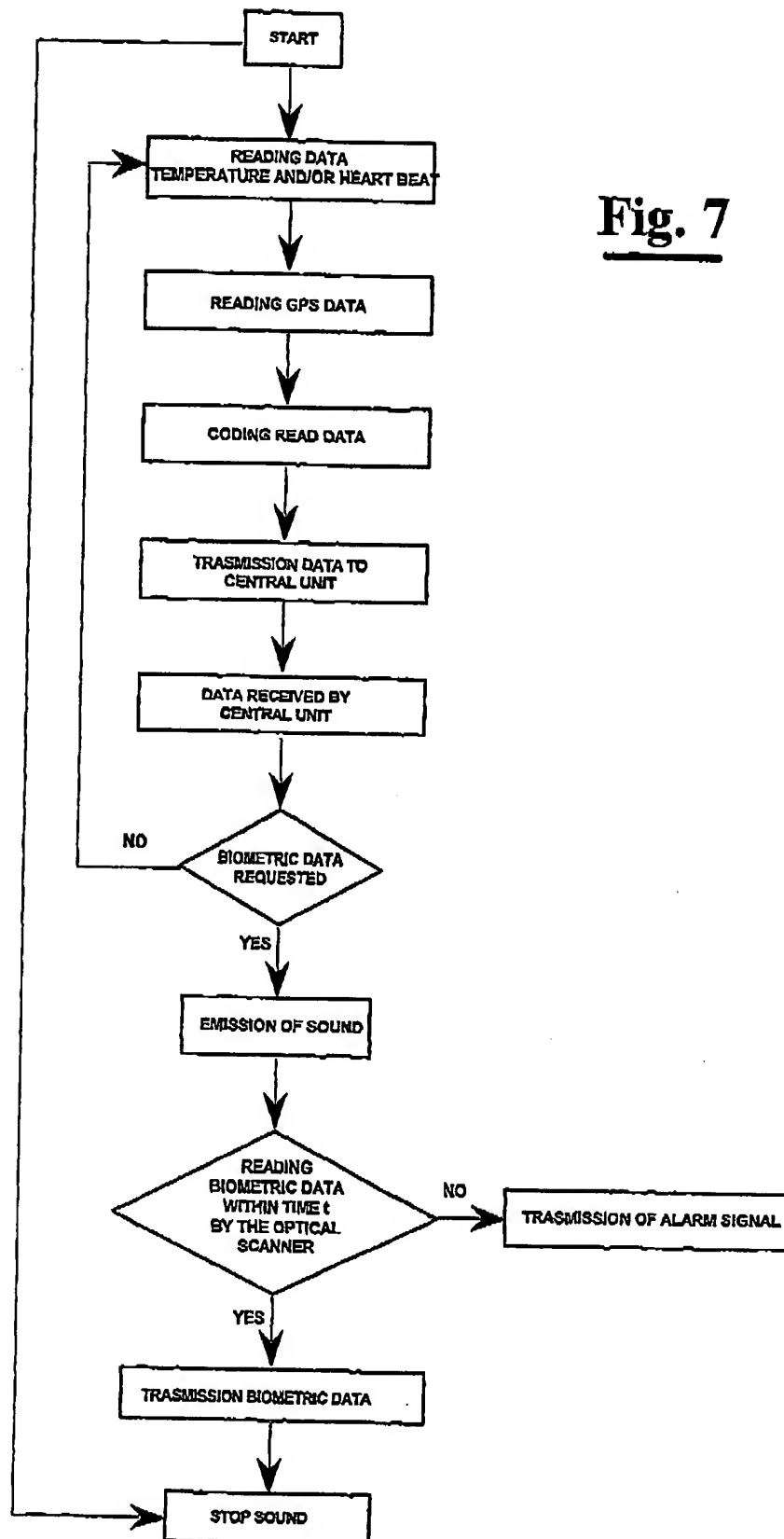
PCT/IB03/00811

Fig. 5**Fig. 6**

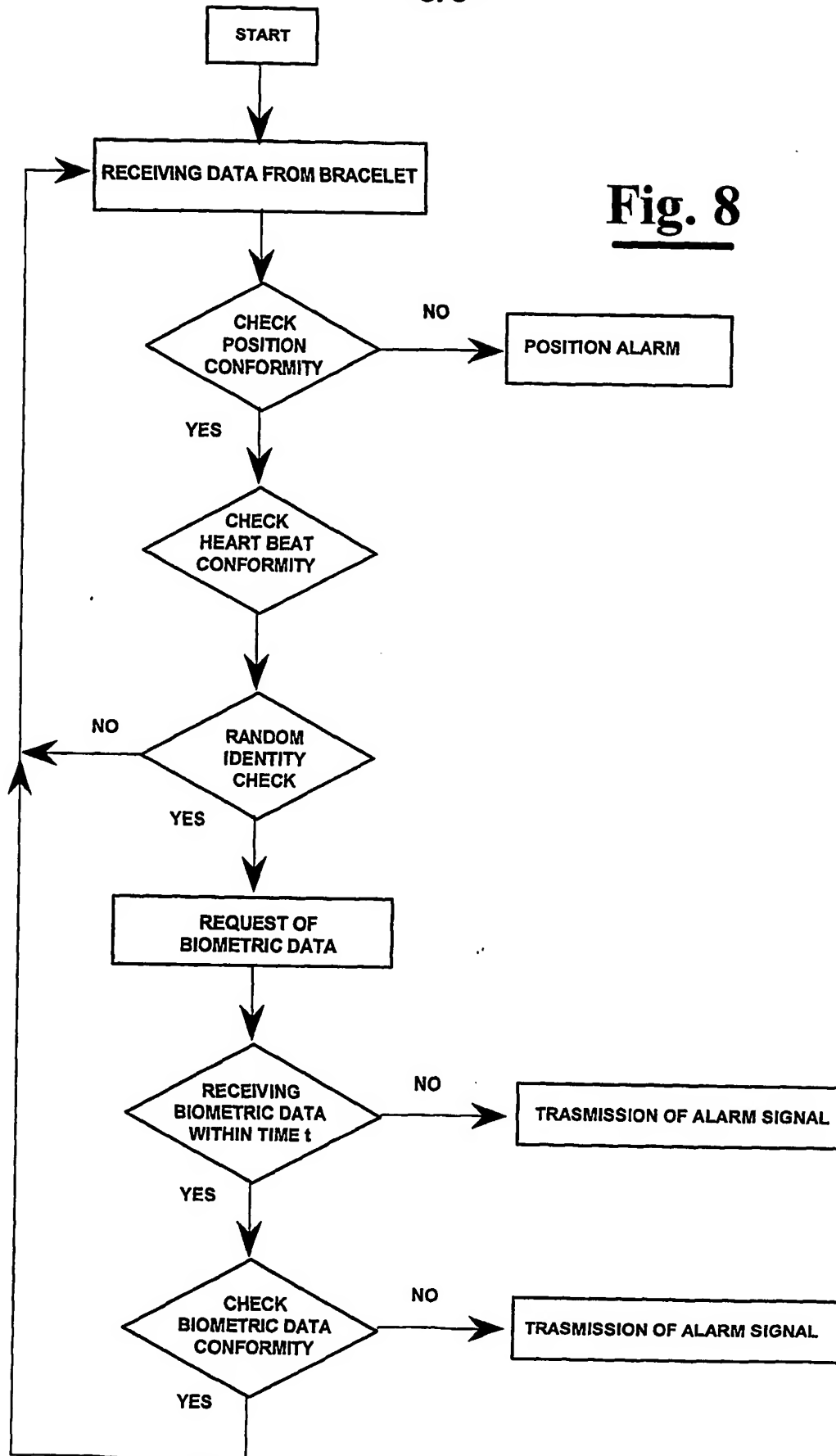
WO 03/075227

PCT/IB03/00811

- 4/5 -

Fig. 7

- 5/5 -



A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G07C9/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 889 474 A (LADUE CHRISTOPH K) 30 March 1999 (1999-03-30) abstract; figures 8,9 column 16, line 15 -column 17, line 15 ---	1-9
Y	WO 01 44836 A (ITALDATA INGEGNERIA DELL IDEA ;BOCCACCI ROBERTO (IT)) 21 June 2001 (2001-06-21) cited in the application abstract; claim 1; figure 2 ---	1-9
Y	EP 0 357 309 A (BI INC) 7 March 1990 (1990-03-07) abstract; figures 1,10 column 19, line 47-54 -----	1-9



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the International filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the International filing date but later than the priority date claimed

- *T* later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the International search

18 July 2003

Date of mailing of the International search report

01/08/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-2040

Authorized officer

Höhn M

BEST AVAILABLE COPY

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5889474	A	30-03-1999	US 5525969 A	11-06-1996
			US 6144859 A	07-11-2000
			US 5594740 A	14-01-1997
			US 6285868 B1	04-09-2001
WO 0144836	A	21-06-2001	IT RM990761 A1	18-06-2001
			AU 2220501 A	25-06-2001
			BG 106797 A	30-05-2003
			BR 0016436 A	01-10-2002
			CA 2397667 A1	21-06-2001
			CN 1411559 T	16-04-2003
			CZ 20021988 A3	13-11-2002
			EE 200200313 A	16-06-2003
			EP 1242835 A1	25-09-2002
			HU 0203788 A2	28-03-2003
			WO 0144836 A1	21-06-2001
			SK 8742002 A3	06-11-2002
			US 2002190864 A1	19-12-2002
EP 0357309	A	07-03-1990	US 4952928 A	28-08-1990
			DE 68924888 D1	04-01-1996
			DE 68924888 T2	13-06-1996
			EP 0357309 A2	07-03-1990
			HK 1006886 A1	19-03-1999
			US 5369699 A	29-11-1994
			US 5204670 A	20-04-1993

BEST AVAILABLE COPY

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.